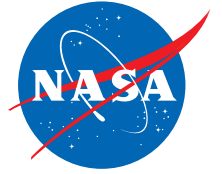


National Aeronautics and
Space Administration



MARSHALL

SPACE FLIGHT CENTER



Economic Impact Report

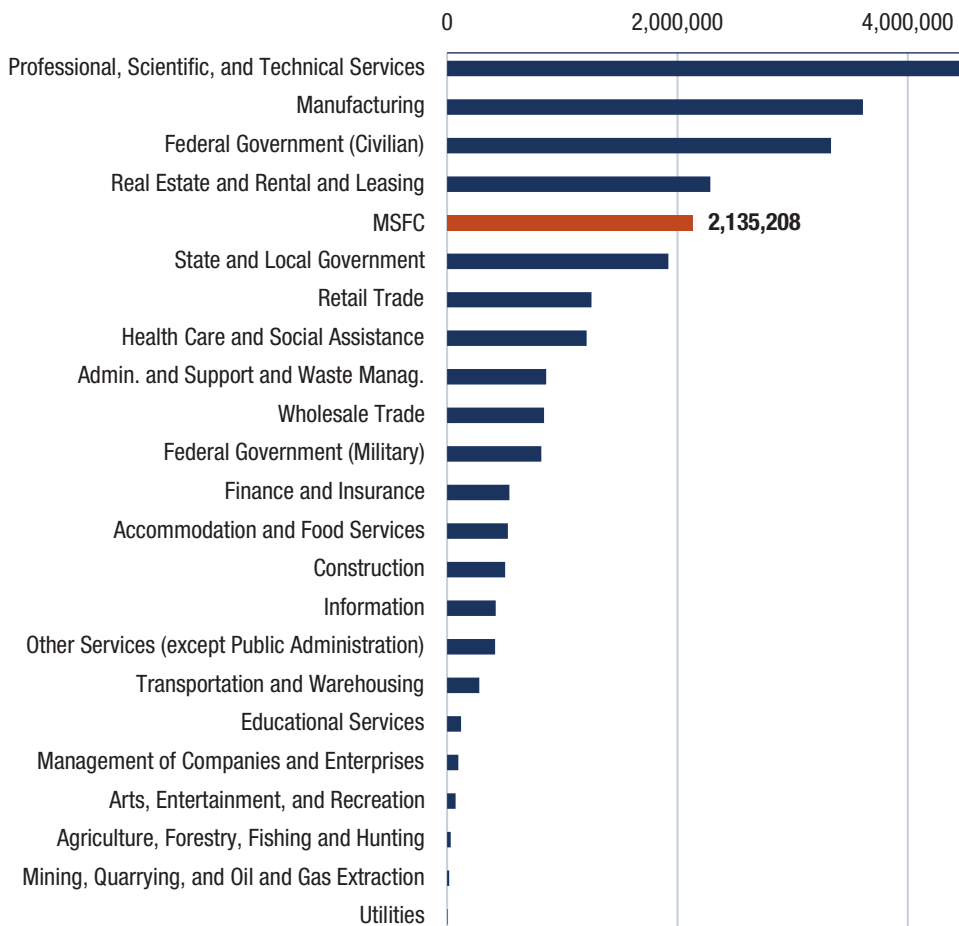




Introduction

In Huntsville, Alabama, NASA's Marshall Space Flight Center (MSFC) is developing the essential launch vehicle and technologies to achieve NASA's human journey to return to the moon and then on to Mars. In doing so, Marshall provides valuable contributions to the community, the state, the region, and the nation. Each year, Marshall creates significant economic impact by supporting thousands of jobs and investing millions of dollars in research and development, driving an innovation-based economy in Alabama and throughout the United States. Marshall manages the Space Launch System (SLS), America's most powerful rocket, designed for human exploration beyond low-Earth orbit and into deep space.

Marshall's output in comparison to top industry sectors in Madison County*



* The economic impact analysis presented here is based on research conducted by the University of Illinois-Chicago: The Nathalie P. Voorhees Center for Neighborhood and Community Improvement.

National Impact

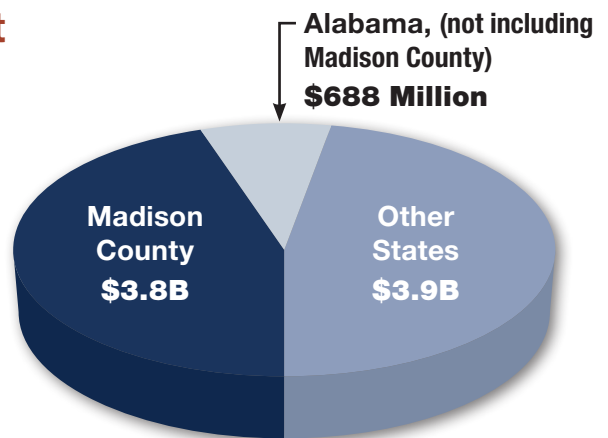
Located in Alabama, Marshall Space Flight Center employs thousands of highly paid, skilled professionals and channels millions of dollars in federal spending in the form of contracts throughout the United States.

Marshall directly employs more than 2,400 civil service workers across the nation. Moreover, for every civil servant employed, approximately 18.5 additional jobs are supported throughout the economy. These jobs come in the form of government contractors and also the dentists, retail workers, school teachers, and others necessary to support the employment base. Additionally, those employees spend money in their community thereby generating significant tax revenues for area economies. Throughout the United States, Marshall supports more than 47,000 jobs and generates a total economic output of \$8.4 billion along with \$1 billion in federal, state and local tax revenues.

Economic Impact



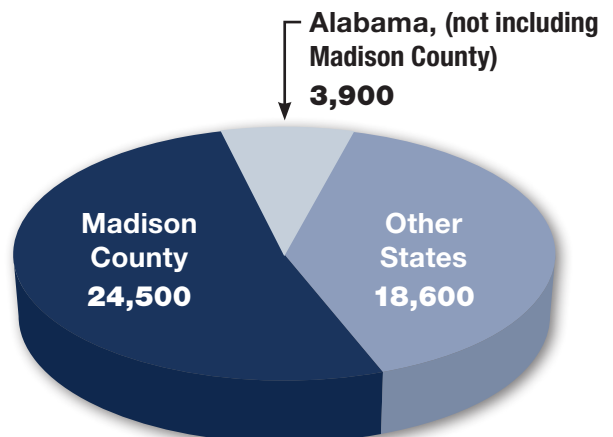
\$8.4 Billion



Jobs



47,000 jobs



State Impact

Alabama

Marshall Space Flight Center has an enormous impact in its home state of Alabama. Not only does Marshall generate \$4.5 billion in economic impact while supporting more than 28,000 jobs, but it also contributes more than \$110 million in state and local tax revenues. Additionally, more than half of all of Marshall's contracts are sourced within the state of Alabama – totaling \$1.8 billion in procurement dollars.

To put this in perspective, Marshall Space Flight Center's contributions to the state of Alabama made up approximately 1.2% of the Gross State Product in 2017. This is larger than the contributions of the agriculture, mining, or educational services sectors.

Economic Impact



\$4.5 Billion

Jobs



28,000 jobs

Tax Revenue



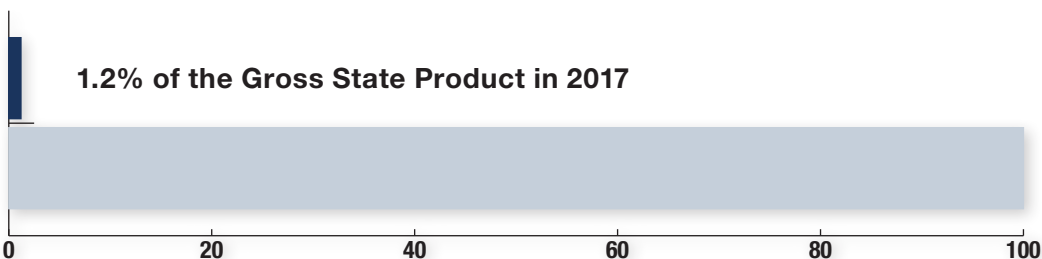
\$110 Million

Procurement



\$1.8 Billion

1.2% of the Gross State Product in 2017



Local/Regional Impact

Alabama's 5th Congressional District

Marshall is responsible for more than 24,500 jobs and contributes \$82 million in state and local taxes within the 5th congressional district of Alabama. In addition, Marshall sources \$1.8 billion in contracts in this region.

Alabama's 4th Congressional District

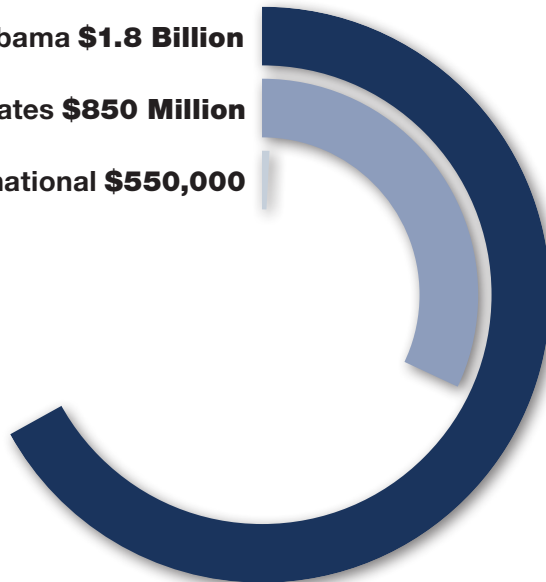
Marshall accounts for 248 jobs and \$1.2 million in state and local tax revenues each year in Alabama's 4th congressional district for a total economic impact of \$70.5 million.

Madison County

Marshall Space Flight Center is the 2nd largest employer in the Huntsville/Madison County area supporting nearly 6,000 civil servant and on-site contract workers. In Madison County alone, Marshall supports more than 24,500 jobs that generate \$1.5 billion in income. In addition, nearly \$1.8 billion in contracts are sourced within Madison County for a total economic impact of \$3.8 billion.

Marshall Procurement \$2.65 Billion*

Alabama **\$1.8 Billion**
Other States **\$850 Million**
International **\$550,000**



* Procurement dollars include all contracts for goods/services originating from Marshall.

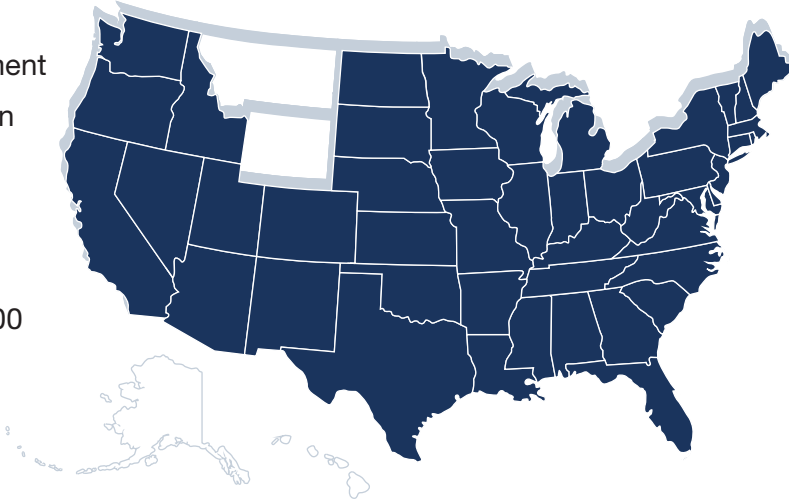
Space Launch System

The Space Launch System is America's most powerful rocket, designed for human exploration beyond low-Earth orbit and into deep space. While Marshall is designing and managing production of the SLS, more than 1,100 companies in 44 states have supported engineering, fabrication and testing of vehicle components, yielding a significant economic impact on its own. In fact, SLS accounts for nearly 65% of all Marshall's economic impacts at the national level.

National Impact (SLS)

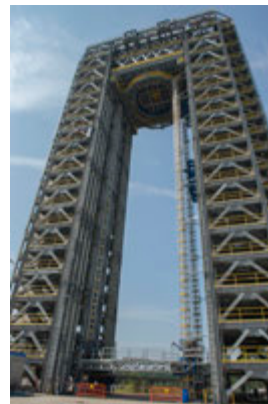
SLS activities support more than 32,000 jobs nationwide and yields a total economic output of \$5.7 billion. SLS contracts originating from Marshall Space Flight Center account for \$1.85 billion and involve almost every major category of manufacturing or service production. SLS generates more than \$680 million in federal, state, and local tax revenues throughout the United States each year.

SLS development and production work is being performed in 44 states by more than 1,100 companies.



Alabama Impact (SLS)

The economic impacts of SLS are heavily concentrated in Alabama. The SLS program supports 15,000 jobs and approximately \$54 million in state and local taxes annually. Additionally, a large segment of SLS contracts, nearly \$955 million worth, are sourced in Alabama. The total economic impact of SLS in the state of Alabama is \$2.1 billion.



Michoud Assembly Facility

The Michoud Assembly Facility, managed by NASA's Marshall Space Flight Center, is essential to NASA's human space exploration mission. It is home to one of the world's largest indoor manufacturing facilities with approximately 43 acres (2.2 million square feet) of climate-controlled space, a deep water port used for transportation, and its own dedicated rail head. Michoud's importance to Louisiana and the nation goes beyond NASA, however. Michoud's multi-tenant facility houses numerous government agencies and private companies.



Jobs



6,000 jobs



Economic Output



\$840 Million

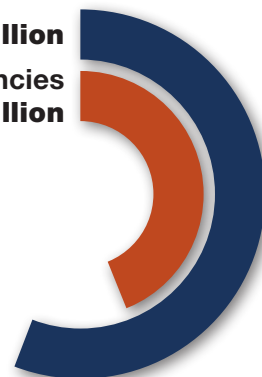


Michoud Government Procurement



\$158 Million

NASA \$89 Million
Other Government Agencies \$69 Million



Building the Space Launch System

Michoud has been manufacturing large vehicles and components for our nation's space program for more than 50 years. Michoud is the main manufacturing and assembly site for the Space Launch System, which will take us first to the moon, on to Mars, and then to the furthest outreaches of our solar system.

Boeing is building the core stage and upper stage of the SLS. Lockheed Martin will build the Orion crew vehicle and has completed the Orion test article, which is expected to launch as part of Exploration Mission 1.

A Unique Multi-tenant Facility

Michoud is a multi-tenant facility with commercial and government partners that are paving the way for a more cost-effective way of operating government-owned facilities. Michoud has approximately 20 tenants, including the U.S. Coast Guard, U.S. Department of Agriculture, Textron, Ochsner, and GE Renewable Energy.

- 60% reduction in operating cost in the Space Shuttle era
- Today over 18% of operating costs are funded by non-NASA tenants
- Increased commercial revenue by nearly 35% since 2010
- Numerous on-site amenities and large-scale manufacturing tools available to tenants



Skilled Workforce

Redstone Arsenal

Marshall is based on Redstone Arsenal, an army base which supports several major commands including the Army Materiel Command and is also home a number of federal and international organizations. Redstone Arsenal supports nearly 42,000 employees daily.



Cummings Research Park



4th largest
in the world



> 2nd largest
in the nation



> 300+ companies



> 26,500+ People



> 1.4% of
Alabama's
total workforce

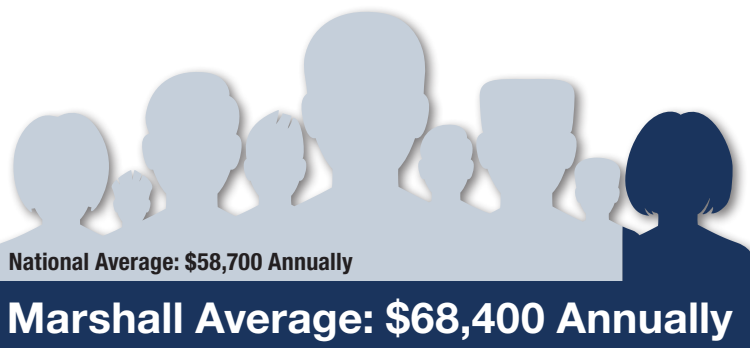


> 13,500
Students

Average annual income at Marshall

Because of the very nature of jobs at Marshall Space Flight Center, the average annual income is higher than the national average. Marshall employs a workforce of highly skilled rocket scientists, engineers, physicists, chemists, and numerous others specializing in STEM related fields as well as professionals in accounting, communications, human resources, and more.

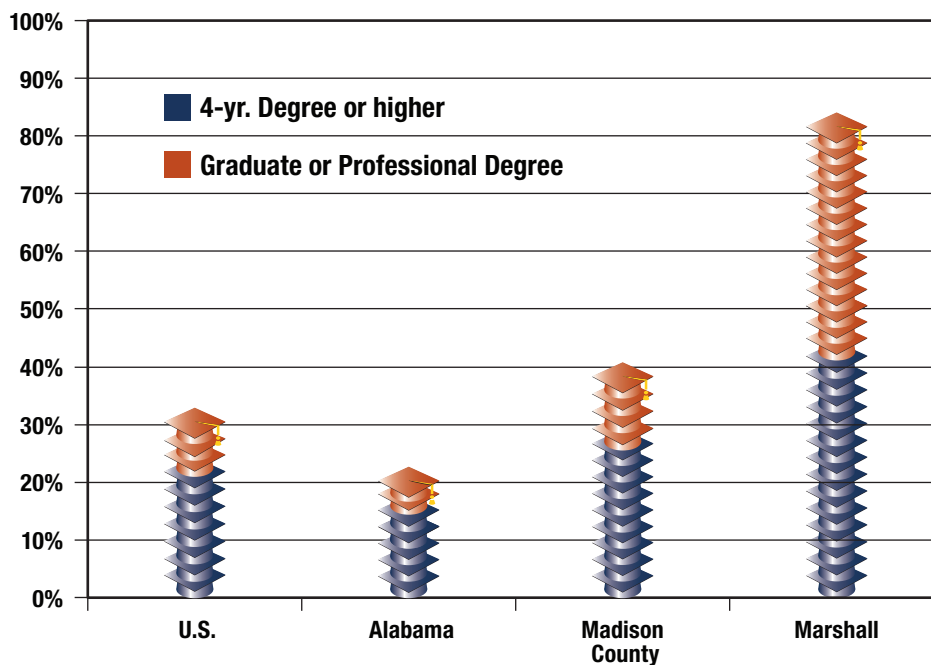
Jobs at Marshall provide an average annual income of \$68,400 which is 17% greater than the national average of \$58,700 annually.





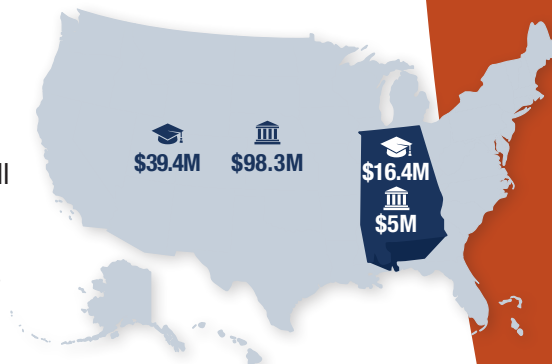
Education

NASA and the Marshall Space Flight Center strive to help maintain a strong American education system, nurturing students' interest in the STEM fields of Science, Technology, Engineering, and Mathematics from elementary school through college. NASA also forges strong ties with the nation's academic centers of excellence and the educators who are shaping the minds of tomorrow's work force. The agency's main goals are to inspire and motivate students to pursue careers in STEM related areas, and to engage the public in shaping and sharing the experience of exploration and discovery.



MSFC Investments in Research Grants

Marshall, like all NASA field centers, maintains a highly educated workforce. This enhances the economic growth and development of the local community. To foster this growth, Marshall provides grants to both educational as well as nonprofit institutions for research that supports different aspects of the agency's mission.



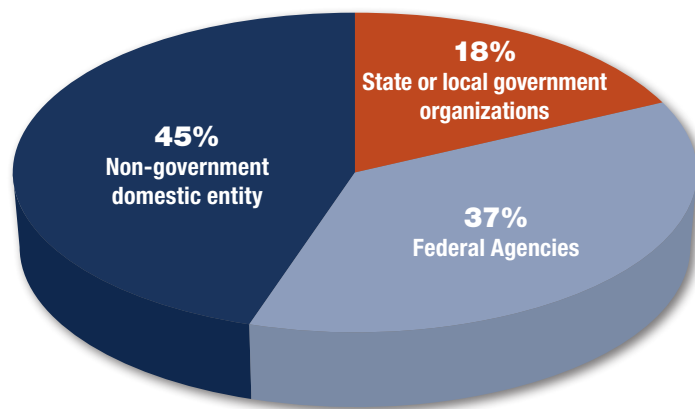
Educational Institution
 Nonprofit Institution

Partnerships

Space Act Agreements

Marshall offers the use of laboratories, test sites, and other cutting-edge facilities, along with the expertise of scientists, engineers and propulsion experts to commercial industry, universities and other government agencies through Space Act Agreements. The goal is to foster development of innovative commercial resources, capabilities and spinoff technologies that benefit everyone.

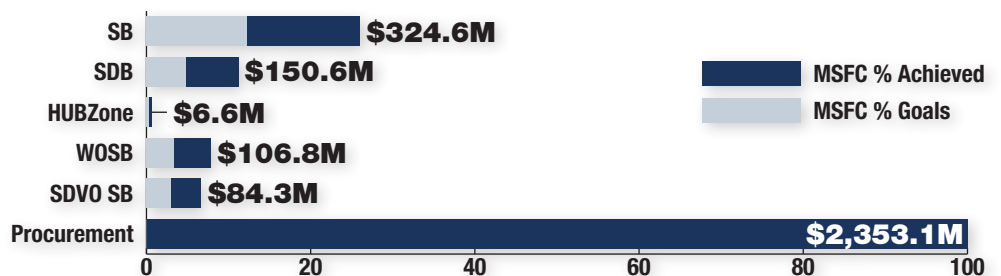
Marshall currently has 337 Space Act Agreements in place



Small Business

Nationally, Marshall supports a variety of small businesses including Small Disadvantaged Businesses, HUBZone Small Businesses, Women Owned Small Businesses, Service Disabled Veteran-Owned Small Businesses, and Veteran-Owned Small Businesses with business opportunities, marketing tools, and special programs such as the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs.

FY17 Small Business Contract Distribution



SBIR/STTR

The NASA Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs fund the research, development, and demonstration of innovative technologies that fulfill NASA needs and have significant potential for successful commercialization.

Goals for the SBIR/STTR programs:

- Stimulate technological innovation
- Increase private sector commercialization of innovations derived from Federal Research and Development funding
- Foster and encourage participation in innovation and entrepreneurship by socially and economically disadvantaged small businesses
- Use small businesses to meet Federal research and development needs

National Impact of NASA Investments in SBIR/STTR



\$173 Million Invested

>



2,412 Jobs Supported

>



\$474 Million Economic Output

Technology Transfer Examples

Rocket Technology Stops Shaking in Its Tracks



In testing, the Ares I launch vehicle displayed a serious vibration problem — shaking that resonated dangerously, causing potentially hazardous conditions in the crew capsule right above the booster. Engineers at Marshall Space Flight Center found a solution, creating a brand new, low-cost, lightweight damper that could become the industry standard for buildings, bridges, and many other structures that vibrate or shake. New York City-based Thornton Tomasetti markets the technology to make buildings safer against the wind and from earthquakes.

Low-Cost Flow Meters Bring Efficiency, Reliability to Nuclear Plants



Innovators at Marshall Space Flight Center co-invented a deceptively simple device to measure the flow of liquid oxygen into rocket engines. The so-called balanced flow meter was then commercialized in industrial applications where it has saved millions, if not billions, of dollars in costs. Most recently, Graftel LLC of Elk Grove Village, Illinois, has brought the inexpensive device to the nuclear industry, where it has dramatically increased flow-measurement accuracy, reduced noise, increased safety, and saved on operation costs.

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